Bearing Surfaces in Total Joint Replacement

THE DESTRUCTIVE EFFECTS of wear and wear debris have challenged the existence of joint replacement. Charnley's initial use of polytetrafluoroethylene (Teflon) resulted in severe destructive granulomas from the Teflon debris. High-density polyethylene at this time continues to be the most used of all substitute bearing materials, but problems with it have now begun to emerge. Many now think that osteolysis is as much related to wear debris as it is to cement fragmentation. The term "cement disease" is considered a misnomer; it should be particle disease.

Attempts are being made to improve the high-density polyethylene as a joint surface material, changing the physical structure by altering its molecular chains. This new material seems to have superior properties when creep, oxidation, fracture, pitting, delamination, and wear are tested in the laboratory. It is unknown if this material will decrease the amount of wear debris when it is used clinically in patients.

Titanium alloy should not be used as an articular surface in joint replacement. Titanium alloy loses its polished surface when articulating against polyethylene and generates particulate debris that produces osteolysis, thus making it ill-suited as a bearing surface for joint replacement. A new process of nitrogen ion bombardment of titanium is being developed and used, but its clinical usefulness is unknown.

Ceramic on ceramic-bearing components also appears to generate considerable particulate debris, and caution must be exercised before this combination is used. Ceramic heads, articulating with polyethylene, have been shown to have superior wear characteristics and thus generate less particulate debris. Time will tell whether the incidence of lysis is affected by ceramic on polyethylene, thus justifying the expense of the ceramic heads.

In addition to the materials chosen, the size of the femoral head is important in joint replacement. The 28-mm head, or midrange head prosthesis, seems to be the best compromise when linear wear and volumetric wear are considered. This head size, though, must be placed in proportion to the patient and the amount of polyethylene in the bearing.

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Arthroscopic-assisted Reconstruction of the Anterior Cruciate Ligament

RUPTURE OF THE ANTERIOR CRUCIATE LIGAMENT can lead to degenerative arthritis of the knee. Persons who participate in sports that require jumping and pivoting are at a high risk for injury leading to repeated episodes of instability, and surgical reconstruction is usually undertaken. Although no procedure can exactly replicate the kinematic and anatomic properties of the anterior cruciate ligament, intra-articular reconstruction with a strong and isometric graft offers the best hope of restoring anatomic and functional stability and preventing future degenerative changes.

Traditional intra-articular reconstruction is associated with substantial morbidity from the surgical dissection necessary to expose the torn anterior cruciate ligament and then implant the substitute. In most cases, this has meant severe pain, swelling, and difficulty initiating range-of-motion exercises in the immediate postoperative period, resulting in a hospital stay of three to five days.

Arthroscopic techniques have recently been used to reconstruct the anterior cruciate ligament by adding a small extracapsular incision along with routine arthroscopic portals. This procedure is often done on an outpatient basis, and usually only an overnight hospital stay is required. With diminished pain, range of motion can be regained early. The cosmetic advantage of arthroscopic-assisted reconstruction of the anterior cruciate ligament is obvious.

The arthroscopic procedure begins with the use of a motorized shaver and burr to remove remnants of the torn ligament and to enlarge the intercondylar notch of the femur to prevent impingement of the graft as the knee extends. A special aiming guide allows a tunnel to be drilled into the joint at the selected tibial attachment site. Work is carried out through this tunnel while viewing arthroscopically, and the femoral attachment site is selected. A strain gauge is used to measure any shortening or elongation between the selected points. If substantial strain is found, the femoral attachment site can be altered. Once an acceptable site is located, the bony tunnel for the anterior cruciate ligament graft is drilled from within the joint, using the tibial tunnel as a working portal. The selected graft (usually autogenous tissue) is then passed through the tibial tunnel, across the joint, and positioned in the closed femoral tunnel. After the graft is securely fixed, immediate range of motion is allowed.

Regardless of the method of reconstruction, all biologic grafts used to reconstruct the anterior cruciate ligament undergo revascularization that requires protection of the graft from excessive activity for several months. Despite the improved cosmetic and perioperative advantages of arthroscopic reconstruction, the long-term outcome is similar to the results achieved by open methods.

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Percutaneous Discectomy

PERCUTANEOUS LUMBAR DISCECTOMY is a safe and effective alternative to laminectomy in some patients who require discectomy for the treatment of herniated nucleus pulposus. Percutaneous discectomy is done under local anesthesia and fluoroscopy with the patient in the lateral decubitus or prone position. The procedure has fewer potential postoperative difficulties than laminectomy or chemonucleolysis, with no epidural scarring, allergic reactions, or serious neurologic complications.

Patient selection is extremely important. The criteria for selection should be strict and include the following: the patient must have shown no improvement after at least six weeks of conservative therapy; the primary complaint is sciatica—that is, leg pain is greater than back pain; paresthe-